

Taking the Fifth

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Contributing Editor

The title of this article may bring to mind organized crime or many members of the Clinton-Gore Administration, but it refers to the 5th gear.

The New Venture 4500 has become a familiar 5-speed transmission in heavy-duty pickups and stripped chassis built by GM and Dodge. A cast-iron 5-speed with an aluminum shift cover, all speeds synchronized, this unit is torque rated at 450 lb.-ft.. Weighing in at a hefty 195 pounds, it can be used in vehicles up to a combined gross weight of 19,000 pounds. The NV 4500 is manufactured in 2- and 4-wheel-drive versions.

The design of the 4500 is similar to the T-5 and AX5 transmissions with the 5th-speed gear (overdrive) and synchronizer assembly mounted on the rear of the countershaft. The 5th-speed driven gear is splined to the mainshaft and retained by a locknut. The gear is designed with a strong interference fit to the main splines.

Dodge beefed up its heavy-duty pickup trucks with options of a diesel engine and a gasoline V-10 engine, both of which have very high torque ratings. Within a short time trucks equipped with these big engines began to have significant failure rates with loss of 5th gear. The transmission could be shifted into 5th gear but when the clutch was engaged would be in neutral. Disassembly revealed that the mainshaft 5th-gear (driven) locknut had backed off and the mainshaft 5th gear had come off the mainshaft splines. At this point shops were busy putting the 5th gear back on the mainshaft and retightening the locknut, only to have a repeat short-term failure.

Now the fun began, with shops changing the mainshaft, locknut and 5th-speed gear. This repair lasted longer, but the transmission would fail again. Some frustrated shops turned to welding the nut onto the mainshaft, which usually resulted in complete failure of the shaft at the weld. Chrysler was seeking a fix, as many of these failures occurred under warranty. It re-



OEM shaft showing short spline length

leased a technical bulletin and parts package on 7/1/98 and on 9/23/98 released an update, which consisted of a special clamp nut, Belleville spring-type washer and thread-locking compound. Chrysler said in the technical bulletin that if the



**Aftermarket shaft with full length spline
Groove for split rings**

mainshaft 5th gear had backed off the shaft, it would have to be replaced in order for the new clamp nut to work. The new clamp nut would be used to replace the original locknut. This new clamp nut had a split in it with a cross bolt threaded through the nut to tighten the clamp load on the shaft after the nut was installed at 280 lb.-ft. of torque.

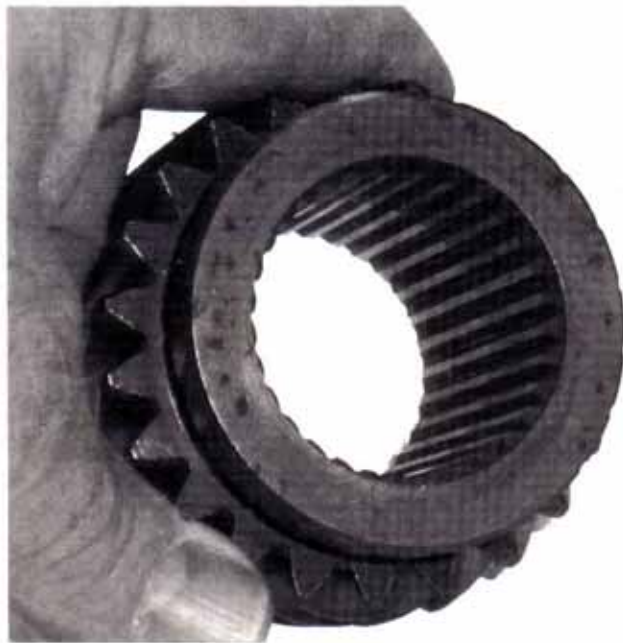
Time would prove that this was not a lasting fix and that the new-design clamp nut also would back

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off. The frustration of these truck owners and the shops performing the repairs had reached epic proportions.

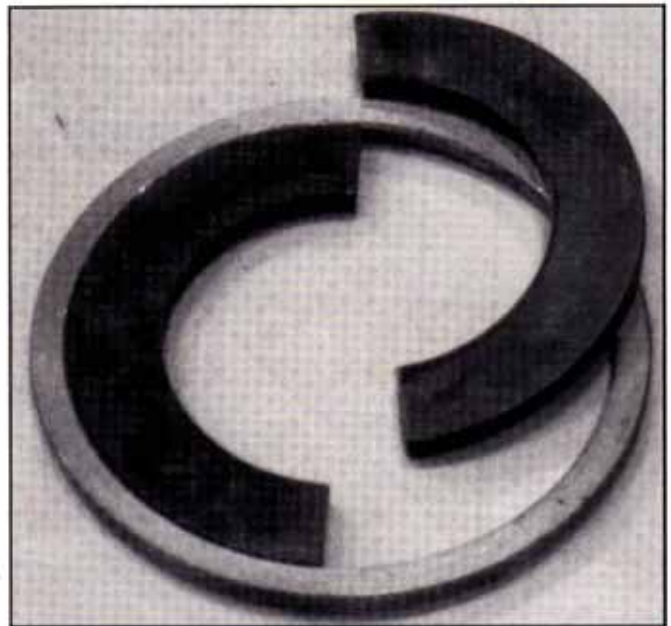
While Chrysler worked to solve the problem, the gearheads in the aftermarket found the problem and created a lasting solution. Anyone who has worked on one of these units knows that the splines on the mainshaft 5th gear run the length of the bore but the splines on the mainshaft are about half the length of the gear. It seemed that increasing the mainshaft splined length would solve the problem, but that did not explain why the nut backed off.

Studying the splines showed that the angles of the two mating splines were such that under heavy torque loads, the mainshaft gear actually could turn slightly on the shaft. This continual movement, though very slight, was enough to



The splines on the mainshaft 5th gear are full length. The shiny area on the spline shows where it rides halfway on the OEM shaft

back off the nut over time. The aftermarket-design output shaft has full-length splines of the proper angle. A groove is machined on the shaft behind the gear, and a set of split rings is placed behind the gear with a circular retainer, which keeps the rings in place. A new mainshaft locknut now tightens the split rings to the mainshaft 5th gear, and the fix is complete. The gear no longer can turn on the shaft, and the thrust load is absorbed



Split rings and retainer positively hold the gear in place and prevent any movement of the lock nut.

by the split rings without contacting the locknut. The shaft replacement kit now is available and is reasonably priced.

This was a tough problem to analyze and fix, but our industry is built on the concept of correcting original design defects and giving the customer the added value of improved performance and reliability with a long-term fix. **TD**

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- 87 Useful information.
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